REMARKS

Claims 1-10 are in this case. All claims have been rejected. Independent claim 1 has been amended to distinguish over the cited references by clarifying that the invention comprises a pair of taps to lock a direct modulated DFB laser to the edge of the response of a grating. This allows the grating to remove high frequency components of the modulated light source for producing the RZ pulses. And, where the laser is locked to the edge of the grating response, the RF power level controls the width of the RZ pulses. Support for the amendments is found in the Specification at page 3, lines 6-11; page 5, lines 4-6; and page 6, lines 5-8.

CLAIM REJECTIONS - 35 U.S.C. §112:

Claims 1 to 10 are rejected under 35 U.S.C. §112, second paragraph as being indefinite because of the use of the phrase "filter response is over a range overlapping at least part of the optical spectrum of the source". Claim 1 has been amended to clarify that the optical spectrum of the source includes the long wavelength edge of the grating response.

CLAIM REJECTIONS - 35 U.S.C. §103:

Claims 1 to 10 are rejected under 35 U.S.C. §103(a) as being obvious over U.S. Patent No. 5,299,212 to Koch (hereinafter Koch), in view of U.S. Patent No. 5,673,129 to Mizrahi (hereinafter "Mizrahi").

It is well established that in order for a combination of prior patents to make a claimed invention obvious, the combination of prior patents must teach or suggest every limitation of the claim. And, "Rarely, ... will the skill in the art ... operate to supply missing knowledge or prior art to reach an obviousness judgment". (Al-Site Corp. v. VSI International, Inc., 174 F.3d 1308 (Fed. Cir. 1999)). Where the prior art references do not teach the limitations, one cannot label them as obvious through hindsight. (W.L. Gore & Assocs., Inc. v. Garlock, Inc., 721 F.2d 1540, 1553, 220 USPQ 303, 312-13 (Fed.Cir. 1983)). In the present case, amended claim 1 calls for a pair of optical taps coupled to the light source and the Bragg grating for tapping a first signal representative of the light supplied to the grating and a second signal representative of the light reflected or transmitted by the grating; and, a feedback circuit responsive to ratio of the first and second signals for adjusting the wavelength λ of the light source to the long wavelength side of the grating filter response to remove high frequency components of the modulated light source for producing the RZ pulses whereby the RF power level controls the width of the RZ pulses. None of the cited references taken alone or in combination teach or suggest these limitations.

Fast return to zero (RZ) optical pulses (narrow in time) are important in high-speed optical communication systems. (Specification, page 1, line 18 to page 2, line 2). Various laser-modulator combinations have been developed to generate RZ pulses, but more optimal combinations of pulse shape, wavelength stability, power consumption, have remained problematic. (Specification, page 2, lines 4-28).

The inventors discovered that a direct modulated laser comprising a grating having a pair of taps and a feedback loop to tune the laser to the long wavelength edge of the grating is a simple cost effective and compact, solution that generates well formed wavelength stable RZ pulses. The selection of the long wavelength side of the gratings response allows the inventive technique to remove high frequency components of the modulated light source for producing the RZ pulses whereby the RF power level controls the width of the RZ pulses. (Specification, page 6, lines 5-8).

Koch discloses wavelength stabilization to an external grating. It requires diverting a portion of the output light to conventional splitters and to the external grating to develop feedback signals for tuning a DBR laser. (Koch, col. 3, line 50 to col. 4, line 25). Koch dose not disclose pulse generation and shaping nor removal of high frequency sidebands and operation on the long wavelength side of the grating for purpose of generating well shaped modulated fast pulses. Koch also does not disclose control of pulse width by controlling the power of the RF modulating source while operating at the long wavelength of the grating's response. And, as the Examiner correctly states, Koch does not disclose the use of a pair of optical taps to develop the feedback signals.

Mizrahi teaches a two-step process. First, Mizrahi's system provides an absolute wavelength reference in the form of a laser locked to a wavelength reference, such as a grating, Fabry-Perot resonator, volume grating, or gas filled lamp. (Mizrahi, col. 6, lines 33 to 66). Then Mizrahi teaches feedback loops to adjust the gratings in a multi-channel system to the reference by temperature tuning of the gratings. (Mizrahi, col. 12, lines 15 to 18). Mizrahi teaches the use of a single optical tap. (Mizrahi, col. 12, line 7). By contrast, The instant invention calls for the use of a pair of optical taps to tune the laser to operate at the long wavelength side of a grating response. Mizrahi therefore teaches away from the instant invention by teaching the use of only one tap.

There is no suggest, teaching, or motivation in Koch or Mizrahi, to cause one skilled in the art to combine Koch with a pair of optical taps to yield the instant invention that generates well formed, pulse width adjustable fast pulses and can be fabricated in a compact physical arrangement using a grating with a pair of optical taps. And, Mizrahi does not correct the deficiencies of Koch, nor does it render the invention obvious when taken alone.

In view of the foregoing, it is submitted that claims 1-10 patentably distinguish from all cited art and now fully comply with the requirements of 35 U.S.C. §112, second paragraph and 35 U.S.C. §103(a). It is respectfully urged that this amendment be entered as placing the case in condition for allowance. Reconsideration and favorable action in this regard are therefore earnestly solicited.

Respectfully submitted,

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AMENDED CLAIMS SHOWING CHANGES

1. An optical pulse source for generating RZ pulses at a wavelength λ comprising:

a modulated light source for generating optical pulses of light over an optical spectrum including λ, the source modulated in power and frequency, the modulated light source modulated by a radio frequency (RF) modulating source having an RF power level;

a Bragg grating having a filter response, the grating coupled to the light source and stabilized so that the [filter response is over a range overlapping at least part of the optical spectrum of the source] optical spectrum of the source includes a long wavelength edge of the filter response;

a pair of [one or more] optical taps coupled to the light source and the Bragg grating for tapping a first signal representative of the light supplied to the grating and a second signal representative of the light reflected or transmitted by the grating; and,

a feedback circuit responsive to ratio of the first and second [tapped] signals for adjusting the wavelength λ of the light source to the long wavelength side of the grating filter response to remove high frequency components of the modulated light source for producing the RZ pulses whereby the RF power level controls the width of the RZ pulses.